MARIE LAKE

REVIEW AND ASSESSMENT REPORT

MARCH, 1987

Prepared For: Improvement District #18(S)
Prepared By : Alberta Municipal Affairs

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1. INTRODUCTION

1. INTRODUCTION

1.1 Planning Process

The Marie Lake Review and Assessment Report contains a detailed analysis, interpretation and evaluation of the resource information contained in the Background Report. Based upon this review, conclusions can be drawn, identifying the lake's capacity and capability to permit future development. Once this step is completed a future development plan can be prepared. This plan will identify not only the best possible land uses but also identify initial policy statements. All of this information will then be utilized as the basis for the final area structure plan.

To effectively analyze the Background Report and formulate a future development plan, the following information was reviewed:

1. Physiographic and biophysical capacities and constraints;
2. Socio-economic factors and the demand for recreational areas; and
3. Management goals and objectives.

The first criteria involves a detailed analysis of the natural resource characteristics of the planning area. It requires identification of those areas physically suitable and unsuitable for future development. The topography, soil structure, watershed, water quality and fish and wildlife habitats all affect the capability of the lake environment to support increased development.

The second criteria identifies socio-economic factors which could affect future lake development. Existing land uses and development, property owner attitudes and perceptions, transportation networks, public accessibility and future demand for recreational facilities all play an important role in determining the future use of the lake.

The third criteria focuses on the identification of the planning goals and objectives. This determines the future role Marie Lake will play in the recreational potential of the Lakeland Region.

A development plan was then prepared. This plan reflects both the various physical, biological and social development constraints and capabilities as well as the overall planning goals and objectives. From this plan an eventual area structure plan will be prepared and adopted.

To assist in the identification of the development constraints and capabilities and to determine planning goals and objectives, a planning committee was established. This committee consisted of representatives from the Improvement District, property owners, lease holders and as required, affected government agencies.

1.2 Purpose

In summary, the purpose of the review and assessment report is to analyze the existing information provided in the Background Report. The assessment is based upon an analysis of the suitability for residential, recreational, conservation, agricultural and resource development. A development plan can then be prepared which addresses both the capabilities and constraints of the planning area and the demand for future development. This report and the development plan will be used as the basis for further discussion and involvement by the Improvement District, property owners, the general public and affected government agencies in the preparation of the final area structure plan.

2. RESOURCE ASSESSMENT

2. RESOURCE ASSESSMENT

2.1 Introduction

Both the physiographic and biophysical characteristics of the planning area need to be analyzed with a view towards identifying the lake's capability to support future development. The physiography section includes an analysis of the topography, soils, water tables and drainage patterns. The biophysical section includes an analysis of important fish and wildlife habitats, as well as the lake's water quality.

2.2 Physiography

2.2.1 Slopes and Soils

The slope of the land and existing soil characteristics play a major role in identifying developable areas, specifically the physical capability of the area to withstand on-site sewage disposal, road and building construction and intensive recreational activities. Problems of erosion, poor and excessive soil permeability and the potential for groundwater and lake contamination from residential or recreational development can severely restrict developable areas.

The planning area was divided into four physiographic units (Map 1) identified through an evaluation of the physical characteristics[1]. Average slopes are predominantly within the gently undulating category (0-10% slope) and are considered to be suitable for residential, recreational or road development (Map 2). Smaller areas of moderately rolling slopes (10-15%) exist along the north and southeastern shoreline. In these areas, development of any type, including lake access, would be restricted by steep shoreline banks and rough backshore terrain. Further, soil erosion caused by widespread vegetation clearing could result in excessive surface runoff and sloped destabilization.

The predominant soil type is a moderately well-drained loam of glacial till origin. Identified as the La Corey soil series, these soils generally pose no serious development constraints. However, located in the south, the northwest and northeast sections of the planning area are extensive areas where the soil properties could create severe development constraints[2]. These areas are primarily organic and are characterized by seasonally high water tables, surface ponding and poor drainage.

Wetland areas are a relatively minor problem. There are two small areas which are considered wetland; along the south shore at the Marie Creek outlet and west of the western shoreline. In these areas standing water would restrict all development.

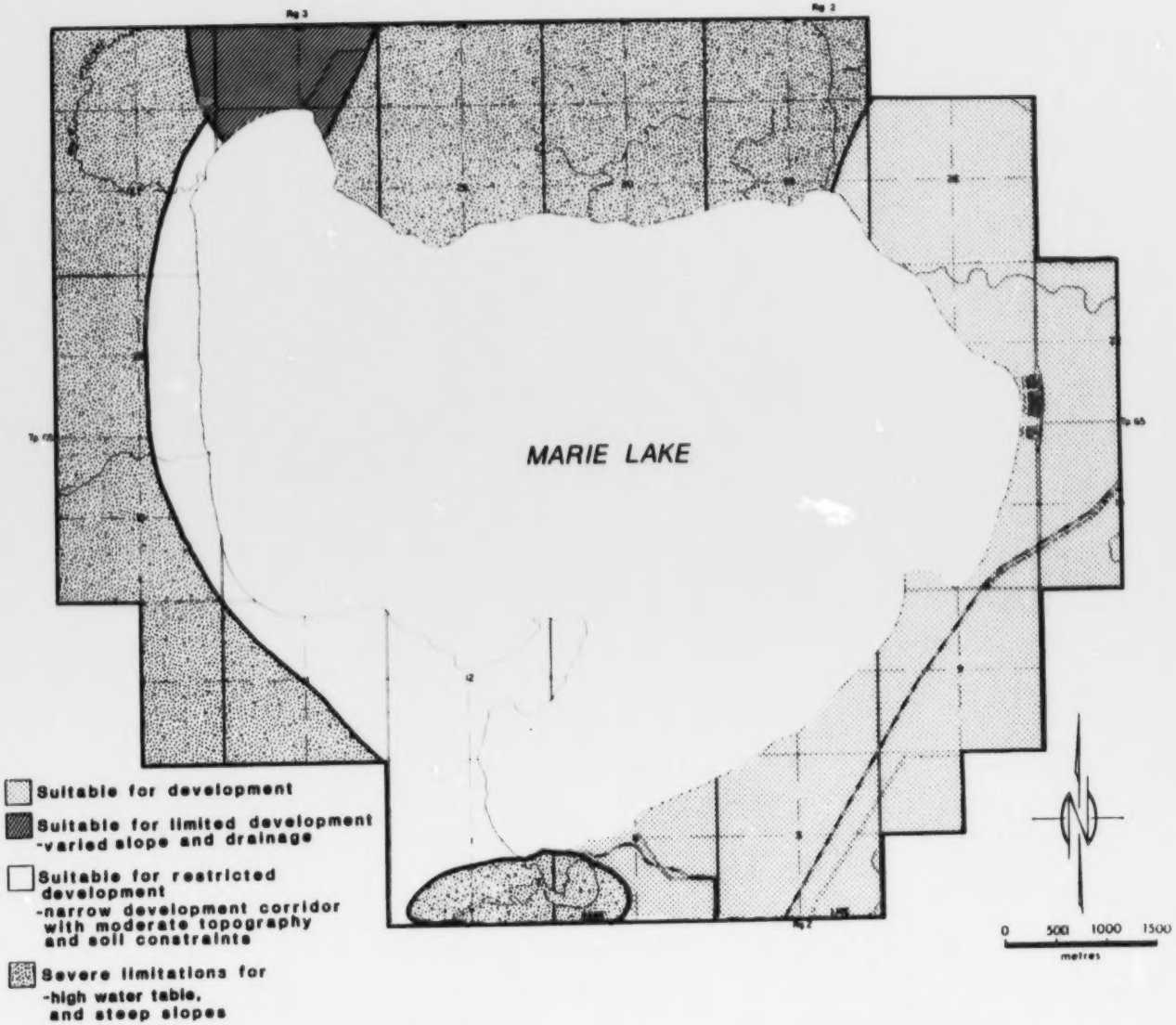
Generally, the physiographic characteristics appear to offer no major development constraints. There are, however, areas where development could result in severe damage to the environment from ineffective sewage disposal or excessive slope erosion. These areas have been identified on Maps 1 and 4 as having severe limitations for all types of development. Other areas have been identified as having moderate limitations to development. Along the extreme NW corner of the lake and the western shoreline, slow soil percolation rates and a potential for ponding could create some problems with sewage disposal. However, dispersed development and passive recreational activities could be considered; site specific studies would be required to determine the type and density of development which could be provided in these areas.

[1] It is important to note that physical constraints identified in the planning area must be considered very general and are not intended to be site specific. Intensive on-site investigations would still be required for future development proposals.

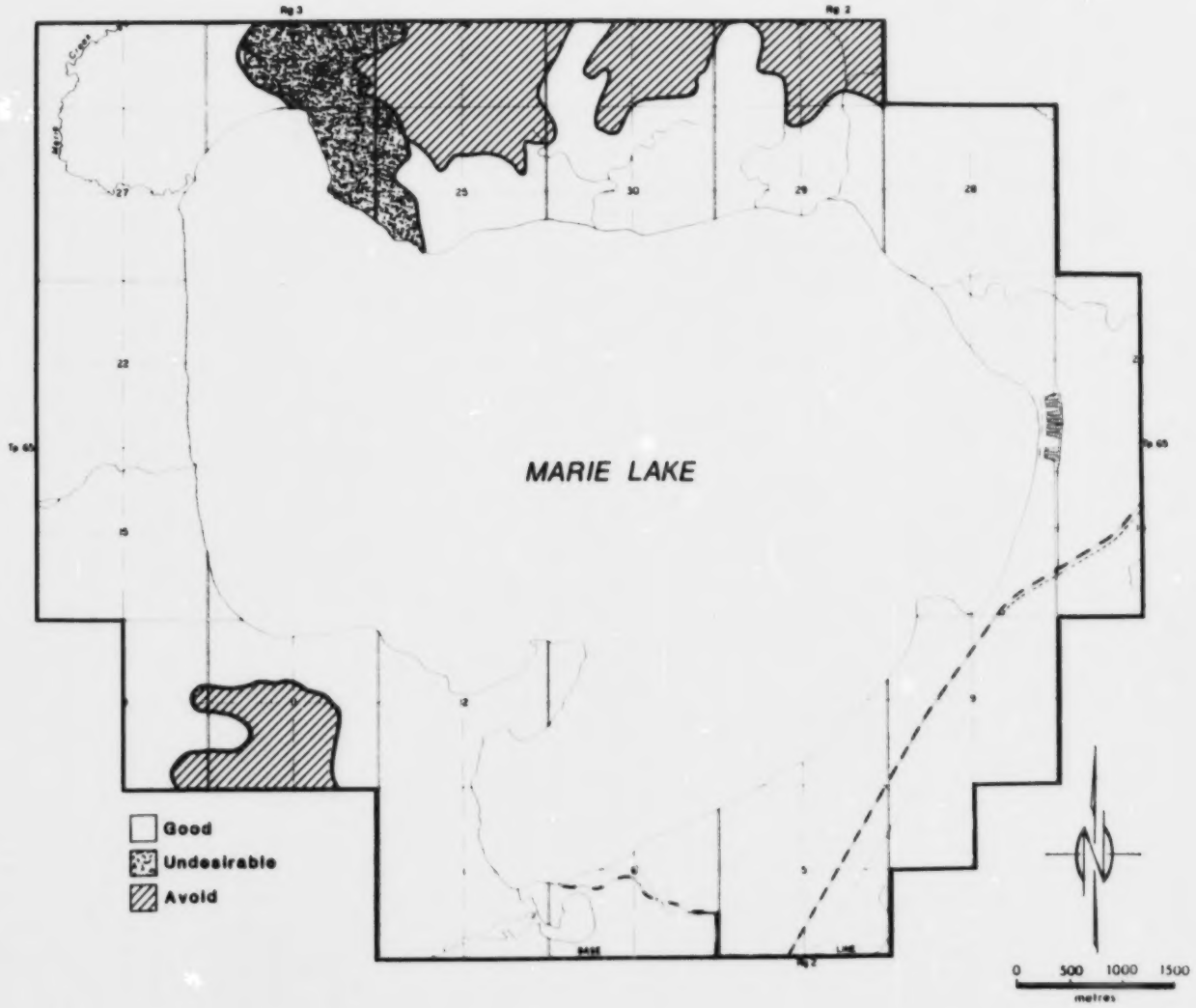
[2] Map 2 provides a site analysis for a specific development. Road construction is principally determined by the physiographic characteristics.

Map 1

PHYSICAL LAND ASSESSMENT



Map 2
ROAD BUILDING SUITABILITY



2.2.2 Groundwater Supplies

With the possibility of increasing recreational and residential development (both permanent and seasonal), lake users will require a sufficient local potable water supply. The availability of ground water and its chemical content, therefore, will have an important effect on the type and location of future development.

Existing ground water supplies in the planning area range from a possible 1-5 imperial gallons per minute (igpm) along the south shore to a possible 25-100 igpm for the balance. Based upon Alberta Environment's set development standards of requiring 240 imperial gallons per day per residence, it can be assumed that ground water supplies should be able to accommodate most types and intensities of development. The water quality studies also indicate that potability would not be considered a limiting factor to future development.

2.2.3 Lake Levels

Fluctuating water levels were identified by the land owners as a major development concern. This issue directly relates to the possibility of Esso Resources Canada using Marie Lake as their water source to develop their oil sands leases. Esso Resources, however, has indicated that no water from Marie Lake would be required to operate future heavy oil sands projects. Alberta Environment, however, notes that under **The Water Resources Act**, and in accordance with **The Cold Lake – Beaver River Management Plan**, up to 1200 dam3/year may be withdrawn from Marie. They have added that such withdrawls would be similar to natural conditions and that future fluctuations would more readily result from precipitation and the building or removal of beaver dams in the watershed.

2.2.4 Historical/Archeological Factors

Marie Lake is included in an area of the Lakeland Region that is designated as having a high potential for archeological and historical sites. Alberta Culture has indicated that all future developments should be carefully evaluated and in some cases Historical Impact Assessments could be required prior to any surface disturbance. The developer would be responsible for conducting such an assessment in areas where the proposal could either destroy or alter historic resources. Written approval from the Archaeological Survey should be received by the developer and submitted to the Development Control Officer before a development permit is issued. In this manner the loss of any historical/archaeological resources could be minimized.

2.2.5 Bathymetry

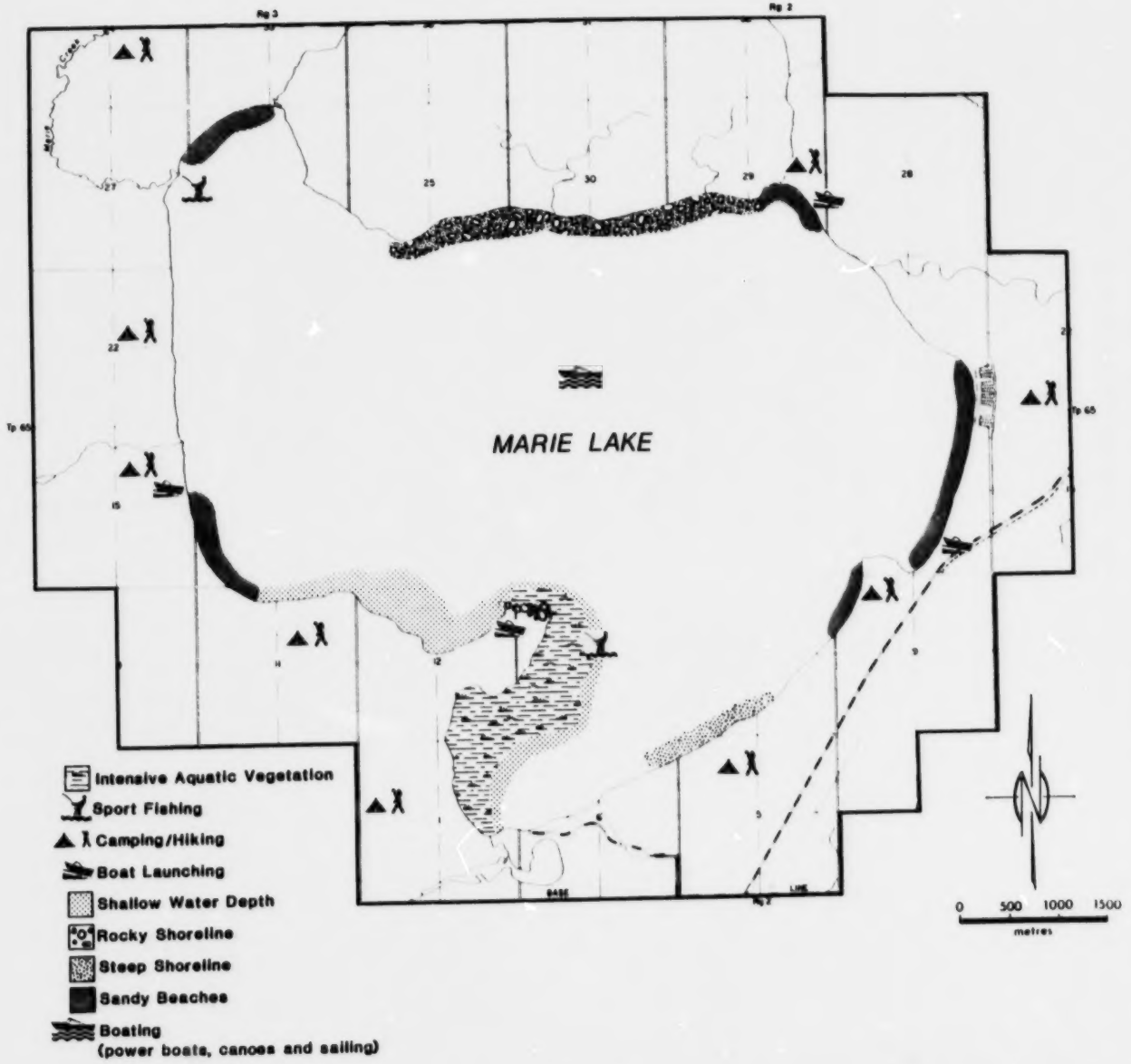
The type of development and the intensity of use which could be permitted on is partly determined by the lake depth and shape. The following is a summary of the lake's shape and slope characteristics:

1. Areas of gentle shoreline slopes, sandy beaches and minimal aquatic vegetation provide excellent recreation areas. Areas with steep shoreline gradients and rocky, vegetated beach composition limit recreational activities. Map 3 identifies the areas on Marie Lake which are classified as excellent beach sites for recreation.
2. The bay, south of the peninsula, is very shallow and contains dense growths of emergent and submergent vegetation. This inhibits both the use of power boats and development of the adjacent shoreline. Power boats and on-shore development would result in disruption of the lake bed, clouding fish habitats and promoting increased vegetation growth from excessive nutrient loading.
3. Between the small bay along the northwestern shoreline and the steep northern shoreline is a sand spit which poses navigational hazards for boats.
4. The small bay west of the peninsula, is also very shallow with a rocky lake bottom which could pose a hazard during the launching or docking of power boats. The shallowness and rocky bottom also provides excellent feeding areas for lake whitefish.

Despite the areas mentioned above, the overall depth, shape and size of Marie Lake provides numerous shoreline areas suitable for both boating and beach activities, (Map 3).

Map 3

ASSESSMENT OF RECREATION POTENTIAL



2.3 Biophysical

2.3.1 Water Quality

A review of the existing trophic state[1] of Marie Lake is required to estimate the carrying capacity of the lake for future development. In this case the carrying capacity is defined in terms of the biological sensitivity of the lake to withstand existing and future development pressures.

Data gathered by Alberta Environment indicated the following[2]:

1. Marie Lake is considered to be a meso-eutrophic or moderately fertile lake. Good water quality is usually equated with meso-eutrophic conditions;
2. Drainage flows from the NW to the SE with limited inflow and outflow channels. Almost 50% of the total annual inflow comes from precipitation and subsequent surface run-off. The annual outflow is less than 50% of the total inflow and the water retention time within the lake is 14.5 years. Consequently the flushing period is extremely low (.03 years);
3. The existing watershed is essentially undeveloped, covered with extensive stands of aspen and pines.

Future development could have a major impact on the existing water quality by increasing the nutrient loading of the Lake. The greatest potential for change would result from development in the watershed. The majority of nutrients entering the lake are derived from the watershed as surface run-off. Clearing the existing vegetation for oil or gas well sites, pipelines, access roads, campgrounds, parking lots and/or residential subdivisions could result in uncontrolled surface run-off and disruption of surface water drainage[3]. It would also increase the possibility of further nutrient loading due to accidental oil spills and improperly operating sewage disposal systems.

This problem is exacerbated by the fact that Marie Lake has an excessively long water retention period. The poor outflow has resulted in a poor flushing time and the lake requires extensive cleaning periods. Whatever nutrients enter the lake will likely remain for over 14 years.

The potential for problems created by watershed clearing is particularly evident within the north and northwestern sections of the planning area. In these areas land clearing and development could result in excessive amounts of nutrients entering the lake through surface run-off and the Marie Creek inlet[4]. It is very important that lands within the northern watershed be maintained in their natural state.

The area south of the peninsula is also very sensitive to development. Shoreline disturbance could increase the nutrient loading resulting in increased aquatic vegetation growth and oxygen depletion. As this area is the most important fish habitat on the lake, increased nutrient levels could effectively destroy the fish population.

The Lake itself, however, generally appears to be capable of withstanding future, well planned development, preferably along the south and eastern shorelines. The large surface area, great water depth and current low level of development suggests that small increases in the nutrient loading would not result in the lake shifting a eutrophic state (most fertile status).

[1] The trophic state of a lake is determined through an assessment of the various physical, chemical and biological characteristics and relates to the total nutrient loading in the water. Increased nutrient loading results in algae blooms, excessive aquatic plant growth, smelly or cloudy water and detracts from the overall enjoyment of lake use.

[2] A Trophic Assessment of Nine Lakes in the Cold Lake Region, Alberta Environment, Water Quality Control Branch, 1981.

[3] Alberta Environment indicates that nutrient loading from a watershed may increase three to five-fold per unit land area as a result of clearing. Forested areas, particularly evergreen forests, may intercept one-third to one-half of annual precipitation.

[4] Alberta Environment notes that activities associated with residences (permanent or seasonal) e.g. road construction vegetation clearing, basement construction, may contribute ten times more nutrients that forested land. The clearing of vegetation eliminates interception of precipitation and results in increased surface run-off the therefore increases erosion, sedimentation and nutrient loading.

2.3.2 Wildlife Habitat

While the area is inhabited by a wide diversity of wildlife species, it is not considered to contain important staging or production habitats. The lack of significant marshland or extensive areas of aquatic vegetation, restricts the development of shoreline habitats for waterfowl. The poor distribution of land forms and low soil fertility in the backshore also provides little habitat protection or feeding grounds.

The large areas of undeveloped, forested lands and the low level of human population, however, does provide numerous habitats for shorebirds, white tailed deer, fur bearers (especially beaver) and the occasional bald eagle. The area south of the peninsula is also used as a resting and feeding habitat for pelicans. Important beaver habitats are located along the northwest shoreline at the Marie Creek inlet. The southern end of the planning area is also considered an important ungulate migration corridor between the critical wintering range east of the lake and summer feeding areas west of the lake, (Map 4).

Current development has had a limited impact on existing wildlife. All of the habitats could, however, be disrupted or lost if substantial clearing of either the forested lands or the aquatic vegetation occurred.

2.3.3 Fish Habitat

Marie Lake is not considered to be an important sport fishing lake. The lack of significant areas of emergent or submergent aquatic vegetation has resulted in poor fish spawning and feeding areas. However, future development should be carefully reviewed in terms of the potential for deterioration of the existing fish populations.

According to regional fisheries biologists, areas of submergent and emergent aquatic vegetation provide suitable spawning grounds for northern pike and perch. Lake areas containing sand/gravel beach areas are best suited for spawning of whitefish and walleye. Lake inlets and outlets are also suited for spawning of northern pike, perch and walleye. Map 4 identifies those areas which have been confirmed as major spawning and feeding areas. The area south of the peninsula, with extensive growths of emergent and submergent aquatic vegetation, is a particularly important fish habitat as well as the areas of the Marie Creek inlet and outlet. The areas north of the Cold Lake Camping society and west of the peninsula have also been identified as important whitefish spawning and feeding grounds. The success of maintaining or enhancing existing fish populations in Marie Lake appears to depend upon protection of these areas[1].

There are two important environmental effects which could threaten the existing fisheries; nutrient loading and lakeshore and lakebed disturbance. Lakeshore and lakebed disturbances include the removal of aquatic vegetation for boating or beach enhancement and increased soil erosion resulting from shoreline development. This contributes to the nutrient loading but more importantly, can significantly alter or destroy fish spawning and feeding areas. Excessive nutrient loading and subsequent deterioration of the lake water quality results from erosion and runoff from cleared land and improperly treated sewage. This contributes to algae growths and when this extra organic material dies and decays, the extra nutrients increases oxygen depletion (eutrophication) in the water and the fish die[2].

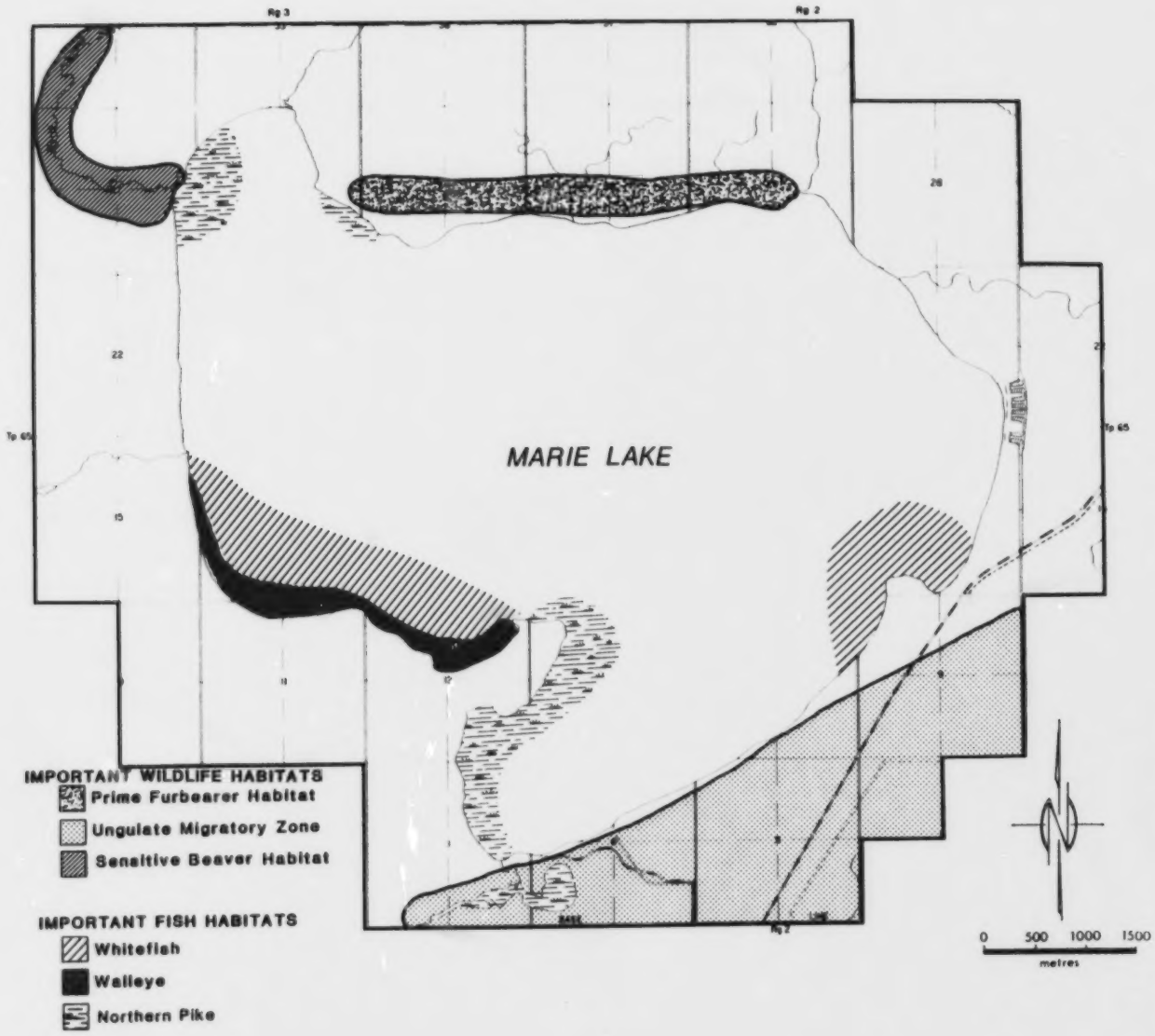
It is difficult to specifically determine how much of the existing fish habitats can be lost before the fish population is significantly reduced. However, because Marie Lake currently contains poor fish populations, it is important that land use planning consider the importance of existing habitats.

[1] The regional fisheries biologists notes that all of the lakeshore/lakebed areas are in some ways important and that the indication of the known and suspected spawning areas does not detract from the importance of other lake areas where foraging, hiding, loafing, etc. can occur.

[2] Any deterioration of the oxygen levels in the lake could have a significant impact on the lake whitefish populations which characteristically prefer well-oxygenated areas.

Map 4

FISH AND WILDLIFE HABITAT ASSESSMENT



2.4 Summary and Conclusion

Land and water related resource characteristics are important factors in identifying the lake's development potential and limitations. Maps 1-4 graphically summarizes the various constraints and capacities found in the planning area. Overall limitations are not widespread but in many areas are compounded by more than one constraint.

Based upon the assessment of the physical and biological features, the following conclusions are provided:

(a) There are two very important areas on the lake where significant growths of emergent and submergent aquatic vegetation occur. These areas are considered essential for fish spawning and feeding. Their removal for recreational activities or their destruction from adjacent shoreline development could seriously jeopardize future fish populations.

(b) Lake water quality is by far the most limiting constraint to development. Future development should not result in excessive deterioration of the water quality and must be carefully planned.

(c) Much of the planning area, including the shoreline, is physiographically suitable for development. However, steep slopes, rocky shorelines, and poor soil drainage properties in the northern area would prohibit future development. Smaller areas along the south shoreline and west of the western shoreline contain muskeg and swamps precluding most types of development. The steep slopes along the southeast shoreline would also preclude accessibility for intensive recreation activities.

3. SOCIO-ECONOMIC FACTORS

3 SOCIO-ECONOMIC FACTORS

3.1.1 Introduction

An analysis of the property owner questionnaire and input from the Planning Committee helped to identify significant lake issues and concerns. User satisfaction, perceived levels of development and concerns over the quality and quantity of development, are valuable indicators of the types and levels of development options socially acceptable on the lake. The following is a summary of the reactions, concerns, perceptions and issues identified by the respondents[1]. These aided in the identification of lake management goals and objectives.

3.1.2 Lake Use

The majority of respondents indicated some problems with Marie Lake for recreational use. Two major complaints were the poor fishing and fluctuating water levels. The occasional roughness of the lake was also noted. The Planning Committee indicated that Marie lake was susceptible to sudden wind storms and that the eastern shoreline could become very treacherous to boaters. The current excellent water quality was one of the prized lake characteristics.

The property owners were also asked to comment on the level of use during average and long weekends. Almost half of the respondents believed that the beach and lake were only lightly used on average weekends, but heavily used on long weekends.

3.1.3 Lake Facilities

There was only one major concern with the existing municipal infrastructure; half of the respondents identified dusty roads as a major development issue. Most of the respondents, however, indicated that existing beach facilities boat launching facilities, and public recreation areas adequately served their needs.

The only public boat launching facility available on Marie Lake is located at the C.F.B. Campsite. Within the existing residential subdivision land owners have public access to the lake via municipal reserves, however, there is no public boat launch area. Only a minority of the property owners indicated there was a need for future public access and public use areas on the lake. Those in favour of such development generally believed it should be located some distance from the residential subdivisions to avoid user conflict.

3.1.4 Effects of Resource Development

Approximately two-thirds of the respondents felt that oil development activity in the Cold Lake Region had not affected the recreational value of their site. The most common complaint was that the increased industrial traffic had led to congestion and deterioration of road conditions. Several respondents, however, noted that the smell from the oil projects did have a negative effect on lake and residential use. There was also concern noted that continued oil development in the area could result in lowered water levels and the possibility of lake contamination from an oil spill. A number of the respondents felt that past industrial development had actually increased the value of their cottages.

[1] Refer to the Background Report for a complete print out of the survey results and a breakdown of individual responses and opinions. Survey results are based on a response rate of 72%, (64 surveys mailed, 46 returned). The members of the Planning Committee reiterated these findings and their opinions are offered throughout.

3.1.5 Levels of Development

The property owners were also asked how future residential/recreational development might affect the recreational use of the lake. Approximately two-thirds of the respondents, fearing "lake overcrowding", indicated that there should be no future development of any kind.

Approximately one quarter of the respondents indicated support for future development but noted that it should be located at well-spaced intervals around the lake to avoid overcrowding.

The property owners were also asked what effect permanent residential development around the lake could have on their cottage use. The majority of the respondents perceived some negative impacts. The most common concerns were: the possible destruction of the natural setting of the area, the problems of increased traffic, noise, lake pollution, road dust, bears and vandalism which would accompany permanent residences. There was also concern expressed that such development would increase the demand for better public lake access. A few respondents felt that permanent residents would help prevent vandalism and could lead to the provision of better municipal services.

Finally the property owners were asked whether commercial services such as a convenience store, or a gas station were desirable in a resort development. About one-quarter of the respondents indicated yes. For those who indicated such services were not appropriate, a majority expressed the concern that commercial uses would destroy the natural atmosphere of the area resulting in increased traffic and an overall increase in the number of lake users. A few respondents also felt that once a small commercial store was established, it would expand. Most of the respondents indicated that there was a sufficient level of commercial service available in the nearby towns. They felt that a small store at the lake would not be able to compete with the existing ones in town, in terms of the range of goods available and price levels.

3.1.6 Summary and Analysis

The majority of the questionnaire responses indicated an overwhelming desire of the land owners to protect Marie Lake from over development and to maintain the wilderness environment. It is also obvious that there is a very negative attitude towards permitting any development which would result in increased public use of the lake.

The natural beauty of Marie Lake, and its clean water were the principal reasons people liked the area and future development is viewed with apprehension. A majority of the respondents stated that there should be no future development on the lake. The balance of responses indicated that while development should be permitted it should be tightly controlled and located elsewhere from the existing developments[1].

[1] Though it was realized that further development might be required and that public access was necessary, the Planning Committee indicated that future development should be strictly monitored and controlled or even curtailed.

3.2 Existing Land Uses

3.2.1 Current Development

To assess the impact of future development it is necessary to measure current levels of development, its type and distribution.

One method of assessment is to compare the number of existing residential subdivision lots in the planning area with the total water surface of the lake. This method assumes that for every residential lot, 4 ha of surface water is required for "full recreational enjoyment"[1]. Overcrowding may occur where less than 4 ha of water surface is available. At Marie Lake there are 56 residential subdivision lots, all of which contain a residential unit. This translates to 67 ha of water surface available for each lot (lake surface area ÷ developed lots). Table 1 provides a breakdown of existing development.

TABLE 1
EXISTING DEVELOPMENT

Lake Surface Area	Registered Residential	Residential Lots Developed	Developed Capacity	Shore Lots
3,777 ha	56	56	100%	29%

Shore Lots Developed	Lake Surface Area Per Registered Lot	Lake Surface Area Per Developed Lot
100%	67 ha	67 ha

[1] Methodology utilized by Alberta Municipal Affairs

This calculation, however, does not consider the impact of use outside the residential subdivision. To assess the impact of the Cold Lake Camping Society, the Fish and Game Association and other lake users, it is necessary to measure user days[1]. Table 2 outlines the lake users and calculates user days for each site.

TABLE 2
USER DAYS

Lake Users	No. of Sites	User Days
Cold Lake Camping Society	75[2]	75 x 3.3 = 247.5
Recreation Lease	1	1 x 3.3 = 3.3
Alberta Fish and Game Association	12	12 x 3.3 = 39.6
Agricultural Holders	4	4 x 3.3 = 13.2
Total	92	92 x 3.3 = 303.6
Residential Lots	56	56 x 3.3 = 184.8
Total	148	148 x 3.3 = 488.4 users[3]

The measurement of user days can also relate to the existing subdivision lots. Assuming an average 3.3 persons per lot, the number of lake users would be 56 x 3.3 = 184.8 persons per day. An estimate of total daily use (long weekend at full occupancy) can then be calculated. The results suggest that during peak periods, approximately 488.4 people could be using Marie Lake. By dividing the total lake surface area (3,777 ha) by the number of users, an estimate of lake use density can be calculated. Present use levels would yield a ratio of 7.73 ha/user.[4] This indicates that Marie Lake is substantially underused.

[1] A user day refers to the impact made by one lake user during one day. Present use levels were calculated from interviews with facility operators. In all cases the calculations are based on summer use only and assumes full occupancy. Alberta Recreation and Parks also assumes that each lot, campsite or cabin contains 3.3 users.

[2] This calculation is based on information available at the time of the lease application. It is, however, estimated that there are substantially more sites currently being occupied.

[3] This figure does not include day users who might use the existing boat launching facilities but do not set up camp at any of the available sites. No estimation is available for this report, however, it is assumed to be low due to the lack of public lake access.

[4] In comparison, Moore Lake has a ratio of 1.7 ha/user.

If a similar calculation is made using the actual number of residential/recreational sites, an estimate of lake density can be established. The existing number of sites is estimated to be at least 148. Given that the lake surface of Marie Lake is 3,777 ha, each site has 25.5 ha of lake surface available for use. Utilizing the fact that overcrowding is perceived to occur once the site density is reduced to 4 ha/site it can be further determined that Marie Lake is undeveloped[1]. These figures illustrate that the total lake use could be substantially increased without approaching the lake's capacity.

3.2.2

Municipal Reserves and Access Points

Municipal reserves on Marie Lake amount to 4.6 ha including 900 m of shoreline. This reserve land resulted from the subdivision process with title currently held by Alberta Forestry Lands and Wildlife. No public development by the municipality has occurred and there are no public recreational or boat launching facilities. The reserve land is primarily used by the adjacent lot owners. The reserve is not marked and there is no road access to the shoreline. There are no other municipal reserve lands on the lake nor further public access points. Demand for public access, however, was instrumental in the initiation of the lake management study and future development sites must be identified.

3.2.3 Boating

Assessment of the potential recreational use of the lake for boating involves identification of the boat density capacity. This compares the number of boats utilized by the existing property owners and recreational users with the amount of water surface available for boating.[2]. On average 4 ha of surface water is required per boat to avoid congestion[3]. On Marie Lake, there are estimated to be no more than 56 boats and each boat would have approximately 59 ha of lake surface. These boats represent only 18% of the lake's total boating capacity. This suggests that Marie Lake would be able to accommodate the type of future development which would generate additional boating activities. Table 3 outlines the data utilized in this assumption. (See Appendix A for further explanation).

Table 3
Boat Use

Boats Operated On Subdivision Lots	Boats Operated On Recreational Lease Sites	Boats Operated On Agricultural Farm Sites	Boats Operated By Fish and Game Association
30	19	4	1

Boats Operated By Day Users	Lake Surface Area for Boating	Surface Area Available for each Boat
2	3,314 ha	59 ha

[1] It should be pointed out that based on the past experience of Alberta Municipal Affairs, the incidence of complaints regarding overcrowding and over-use of the lake will accelerate once the user density is reduced to approximately 4 ha/unit. Therefore, if development at Marie Lake reaches 944 recreation/residential units (3,777 ha÷4 ha) then it is very likely that a majority of the lake users would complain about overuse and overcrowding.

[2] The water surface area of Marie Lake available for boating was determined by eliminating areas of extensive aquatic vegetation along the shoreline as well as areas less than 2 m in depth from the total lake surface area. On Marie Lake the surface area available for boating is approximately 3,314 ha.

[3] Alberta Recreation and Parks methodology

While it has been identified that Marie Lake is only being utilized to 18% of its boating capacity this calculation is not necessarily the most critical determinant. The type of boating (fishing, waterskiing, leisure boating), the lake surface roughness, patterns of localized boating and lake shape and depth area also important factors in identifying boating capacity.

The overall size and shape of Marie Lake is conducive to intensive amounts of boating and water skiing activities. There are no islands and the lake depth alleviates most problems of docking or launching. There are, however, areas where the potential exists for boating problems. Much of the southwestern shoreline and the area north of the Cold Lake Camping Society is characterized by excessive aquatic vegetation growth. These areas provide important fish spawning and feeding habitats. West of the peninsula, the bay area is shallow with a rocky floor. It is also an important whitefish spawning area. Excessive amounts of motorized boating in this area could create navigational and environmental problems. Further along the northwest shoreline a sand spit has been created which causes navigational problems. These areas pose critical constraints to any shoreland development and limits them as a means of access for boating. It should also be noted that during the survey and field research and subsequently stressed by the planning committee, Marie Lake was identified as a very rough lake. This roughness often precludes launching or docking a boat along most of the eastern shoreline.

Current boating activities appear to have a minimal effect on the lake's environment and it is believed that the lake has the capability to accommodate increased use[1]. There are, however, site specific areas where increased boating could result in congestion or environmental damage. These areas have been identified and boating activities should be restricted.

3.3 Transportation

The existing transportation network serving Marie Lake has a major influence on any future development. Marie Lake does not have an existing road system that provides public access to potentially developable areas.

Along the eastern shoreline a well developed government road allowance provides access to the residential subdivisions, the Cold Lake Camping Society and the privately held agricultural land. This road, however, does not circumvent the lake and outside the developed areas, future development would require the construction of new roads and utility services. Road construction is expensive (both in terms of construction and maintenance) and in the case of most of the undeveloped areas of Marie Lake, perhaps costs prohibitive. The Improvement District determines the priority for improved access and overall municipal requirements will influence final project selection and funding. Future development plans must recognize the potential constraints imposed by limited access.

[1] The Planning Committee's perception of current levels of use on Marie Lake supports this conclusion. They indicated that the lake surface appears to be relatively underused.

3.4 Municipal Administration

3.4.1 Improvement District #18(S)

Marie Lake is located within the municipal administrative boundaries of Improvement District No. 18(S). The Advisory Council for the I.D. has adopted both a Land Use Order and a Land Use Strategy which affects all development on private or Crown lands. Within the Land Use Order, the planning area is zoned as Rural District which permits the following as discretionary uses only:

- 1 country residence or farmstead separation (maximum lot size is 2-4 ha);
- intensive recreational uses for high density recreational activities (campgrounds, hotels etc);
- extensive recreation uses for passive recreational activities (non-facility oriented activities).

For these uses the following provisions apply:

- a 30 m buffer zone is to be provided from the shoreline of any waterbody. No structures of any kind shall be permitted within this strip

The Land Use Strategy which was adopted by the Advisory Council as a general policy framework for land uses permitted in the Land Use Order, also provides development guidelines. It serves as both a guide and reference for other government departments and agencies whose actions may influence land use and development in the I.D. Within the Strategy the following districts are identified and policies provided:

- recreation and open space;
- transportation and utility facilities;
- resource extraction;
- country residential; and
- environmentally sensitive areas.

The Strategy and Land Use Order identified local land use issues and concerns and provided goals and specific policies to deal with development proposals. In the case of Marie Lake, these goals and policies have a major impact on future development plans.

3.4.2 Alberta Municipal Affairs

The regulation and control of Land throughout the Province of Alberta is contained within the Planning Act, R.S.A. 1980. Private development on Crown Land is also governed by the provisions of this Act, however, Crown agencies and resource development are exempt. Alberta Municipal Affairs is responsible for implementation of the Planning Act, R.S.A. 1980 and in the case of Improvement District #18(S) is responsible for subdivision approvals. Alberta Municipal Affairs is also responsible for the review and assessment of applications for private development on Crown Lands.

The Planning Act, R.S.A. 1980 contains several regulations which affect future planning and development in the Marie Lake planning area. These are as follows:

- minimum lot size for unserviced residential developments is 1,858 sq. m;
- 10% of multi-lot development shall be provided as public/school reserves;
- 6 m environmental reserve strips shall be provided on all lakeshores.

3.4.3 Crown Land

As noted in the Background Report approximately ninety percent of the land in the planning area is Crown Land, owned by the Province and administered through Alberta Forestry, Lands and Wildlife[1]. It is these large areas of unpatented and leased or reserved lands which hold the key for significant land use changes. The Provincial Government appears willing to investigate the possibility of permitting public or private recreation areas on Crown Land with the intent to provide for the increasing demand for greater recreational opportunities in the region. Further, public demand for access to the lake may influence the Government to view development of a public boat launching facility as a necessity. Future development of Crown land should, however, reflect the policies and guidelines developed through the preparation of the Lake Management Plan.

Alberta Forestry, Lands and Wildlife have indicated their support in the preparation of the lake management plan for Marie lake prior to the issuance of further dispositions.

3.5 Recommendations and Conclusions

The opinions and attitudes of the property owners, current land use boating capacity and access to the planning area are all important factors which must be considered when identifying both the potential for development as well as actual developable areas on Marie Lake.

1. The first consideration is the influence of property owners and their attitude towards more development. The property owner survey indicated that the respondents do not wish to see the lake overdeveloped. They further added that future development should be located some distance from existing developments. Approximately three quarters of the residents also indicated that no commercial development should occur on the lake as it would destroy the natural beauty of the area and attract outsiders.
2. It was determined that Marie Lake is considerably underdeveloped in relation to its surface area. Restricted public access and the low level of development has resulted in a generally under used area.
3. As Marie Lake contains no major physical obstacles and has such a large surface area, boating congestion is not considered to be a potential problem. In areas of environmental sensitivity, boating restrictions could prevent physical damage.
4. Limited access to the lake severely restricts future development. The costs of road construction and maintenance will have a major impact on the location, type and density of any recreational or residential proposal. Both the Improvement District and Alberta Transportation have indicated that there are no future plans for upgrading or expanding existing roads, or for providing new roads to the planning area.
5. Existing Provincial and Municipal legislation requires that general land use policies be incorporated into any future lake development plan. It is also important to realize that Crown lands are the key to land and lake changes and that any lake plan should reflect potential leasing agreements.

While it would appear that Marie Lake has a great potential to accommodate increased recreational and residential developments, attempts should be made to ensure that future land uses are compatible with the existing land use pattern. It is also important that all levels of government jointly review and assess future development proposals.

[1] For a complete breakdown of land tenure within the Marie Lake Planning area refer to Map 16 in the Background Report.

4. FUTURE DEVELOPMENT DEMANDS

4. FUTURE DEVELOPMENT DEMANDS

4.1 Introduction

There are several factors outside the immediate planning area which may affect future development. These include:

(a) future demand for recreational areas on a regional and provincial scale;

(b) oil development activities and associated regional population growths; and

(c) the regional tourism potential.

It is important to forecast residential and recreational demands and to assess the impact on future lake development.

4.2 Recreation Demands

The continued rising standards of living plus increases in disposable income and leisure time appears to indicate that the rising popularity of outdoor recreation, especially intensive recreational activities (swimming, boating, water skiing fishing, etc.) is likely to increase. People are also willing to travel greater distances to avoid overdeveloped and congested lakes[1]. The result has been increased public pressure in Alberta to provide newer recreational facilities as well as greater recreational development opportunities.

The attractive natural qualities of Marie Lake, the relatively undeveloped state of its shoreline and the overall potential for recreational opportunities has resulted in increased local, regional and provincial pressure to permit the development of the lake's recreational potential.

4.3 Oil Development

The development of the oil sand leases held by Esso Resources Canada Ltd. could have a considerable impact on the use of the lake and the natural environment. The most immediate effect would result from the indirect effects of site specific land disturbances; vegetation clearing for well development, service road construction, pipeline and power rights-of-way and the high volumes of industry related traffic on local roads. Further, road construction to serve the new well sites could provide public access to areas of the lake which should not be utilized for any shoreline activities.

Marie Lake, due to its proximity to regional urban centres and the large oil sands projects, provides a focus for future recreational and residential development. Increases in the price of energy results in increased regional population growth which in turn increases the demand for regional recreational opportunities. Overall, development of the regional oil sands deposits will undoubtedly result in increased regional recreational demands.

[1] The property owner's survey and input from the Planning Committee indicated that the majority of residents in the registered subdivision are from Edmonton. To drive from Edmonton to Marie Lake takes approximately 3 hours. The Lakeland Tourist Destination study noted that the major market for tourism in the Lakeland Region will be Edmonton.

4.4 Tourism Potential

Marie Lake is not currently viewed as a provincially significant recreation destination point that attracts large number of weekend/overnight users from outside the region.

However, in 1985 the Lakeland Tourist Study was completed for Alberta Tourism. The Study represented an inventory of natural, cultural, and physical resources within the area and further identified recreation/tourism development opportunities. Marie Lake was identified along with Moore Lake, Cold Lake, Ethel Lake as well as other smaller lakes, as being suitable for the development of commercial campgrounds and public recreation facilities. It was noted that Marie Lake represented a new recreation and tourism destination for Alberta.[1]

4.5 Conclusion

It is anticipated that local and regional recreational demands on Marie Lake will continue to increase. Furthermore, growth is expected in the recreational development of the lake should opportunities be allotted. It is, however, anticipated that the demand for residential lots will remain low, due in part, to the drop in oil prices, the large supply of available residential lake lots in the region and the overall slow economic climate. The development of the soil sands projects could drastically alter this situation but current demand levels only require immediate public access to the Lake.

[1] The Alberta Tourism study is intended to identify tourism development opportunities for both the private and public sectors. To date, Alberta Tourism acts as a facilitator, but does not develop these facilities nor offers financial incentives to potential developers. Thus, it will be the responsibility of potential investors to act on any development recommendations for Marie Lake.

5. MANAGEMENT GOALS AND OBJECTIVES

5. MANAGEMENT GOALS AND OBJECTIVES

5.1 Introduction

Lake management goals and objectives have been identified through the review and assessment of the Background Report and discussions with the Planning Committee and the Advisory Council for I.D. #18(S). These attempt to address as many of the planning constraints, issues and concerns as possible and consist of a series of guidelines which must be considered in both the allocation of specific uses and the implementation of development policies.

5.2 Management Goals

1. Marie Lake has been identified as a potential area for increased recreational demands, both on a regional and provincial scale. The development plan must therefore recognize this potential and provide opportunities for future development, especially in terms of increased public access to the lake.
2. The development plan must realize the importance of maintaining or enhancing the quality of the natural environment. The plan will ensure that future development will not result in use levels beyond the lakes physical capacity or in a deterioration of the water quality.
3. Existing land uses are an important factor in future land use planning. The development plan will attempt to maintain the viability and social environment of existing developments while recognizing both the opportunities and demand for future development.
4. The development plan will provide for the optimum use of the lake and the planning area without imposing financial limitations to the Improvement District or restricting the general policies governing the use of Crown lands.

5.3 Management Objectives

The following objectives were identified to implement the above noted management goals:

1. To encourage orderly and well planned development so that it will not detract from the existing natural environment.
2. To encourage the development of areas suitable for public recreation and to increase public access to the lake.
3. To ensure that no future development occurs in areas with severe soil or topographic limitations.
4. To ensure that no future development occurs in areas of important fish and wildlife habitat.
5. To conserve those lands in the watershed area where excessive vegetation clearing could result in increased nutrient loading of the Lake.
6. To ensure that future development does not result in increased servicing costs to the Improvement District.

6. CONCLUSIONS, ASSESSMENT AND RECOMMENDATIONS

6. CONCLUSIONS, ASSESSMENT AND RECOMMENDATIONS

6.1 Introduction

The conclusions, assessment and recommendations are based upon the preceding analysis of the physical, biological and socio-economic characteristics of the Marie Lake Planning Area. Each statement provides direction towards establishing future land use allocations and development policies which could be included in the final area structure plan. Two composite maps (Maps 5 and 6) detailing land use development constraints and potential have been prepared.

6.2 Conclusions

6.2.1 Physiography (Map 5)

(a) Average slopes around Marie Lake are predominantly gentle to undulating (0-10%) and with the exception of the steep banks along the north and southeastern shoreline, would not generally restrict development.

(b) The soil properties indicate that the land is generally well suited for residential and recreational development. Specific areas where poor drainage, high water table and unsuitable soil structure would limit development occur in the western, northwestern and southern sections of the planning area.

(c) Ground water supplies appear to be readily available and according to Alberta Environment would not affect future development opportunities.

(d) Lake levels, although identified by the property owners as fluctuating abnormally, appear to respond more to beaver dams and precipitation than to recreational, residential or natural resource development.

(e) The area is considered to have a high potential in terms of archaeological and historical sites and according to Alberta Culture should be protected.

6.2.2 Bio-physical

(a) Marie Lake is not considered to be key habitat area for wildlife. The lack of significant areas of wetlands or shoreline vegetation, the lack of a diverse topography and poor soil fertility greatly reduces the areas required for feeding and production. The lake, however, does provide an important feeding habitat for pelicans.

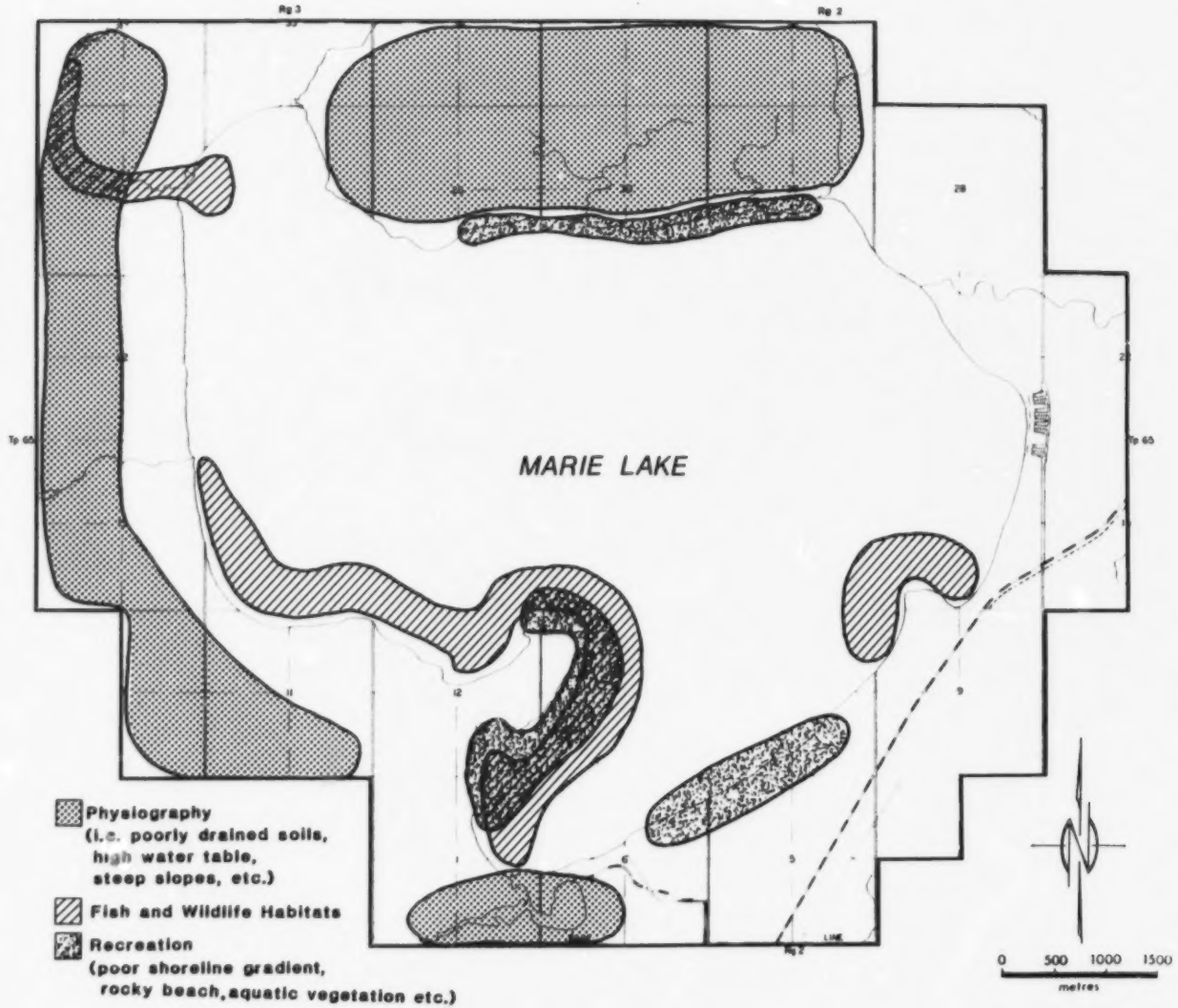
(b) Marie Lake is not considered to be a significant sport fishing lake. Major fish habitat areas occur south and west of the peninsula, along the Marie Creek inlet and outlet and north of the Cold Lake Camping Society. These areas contain important emergent and submergent aquatic growths and west of the peninsula a stony shoreline is suitable for whitefish. Overall, however, a lack of significant areas of shoreline aquatic vegetation greatly reduces spawning and feeding habitats.

(c) The large surface area of Marie Lake, its great depth and the relatively undeveloped state of its shoreline have resulted in the lake being classified meo-eutrophic or having good water quality. Nutrient loading of the lake has not been significant enough to cause excessive algae or other aquatic plant growth (which results in lake eutrophication or oxygen depletion). The lake, however, has a very slow flushing period and water entering the lake (primarily through the watershed) remains in the lake for an abnormally long period of time.

(d) The lake's watershed is very important to the overall capability of the lake to support future development. Approximately fifty percent of the lake's annual inflow results from surface runoff and drainage has a major impact on the lake's water quality. The drainage pattern is primarily in a southeasterly direction and disruption along the north shore could have a major impact on the nutrient and sediment levels in the surface run-off.

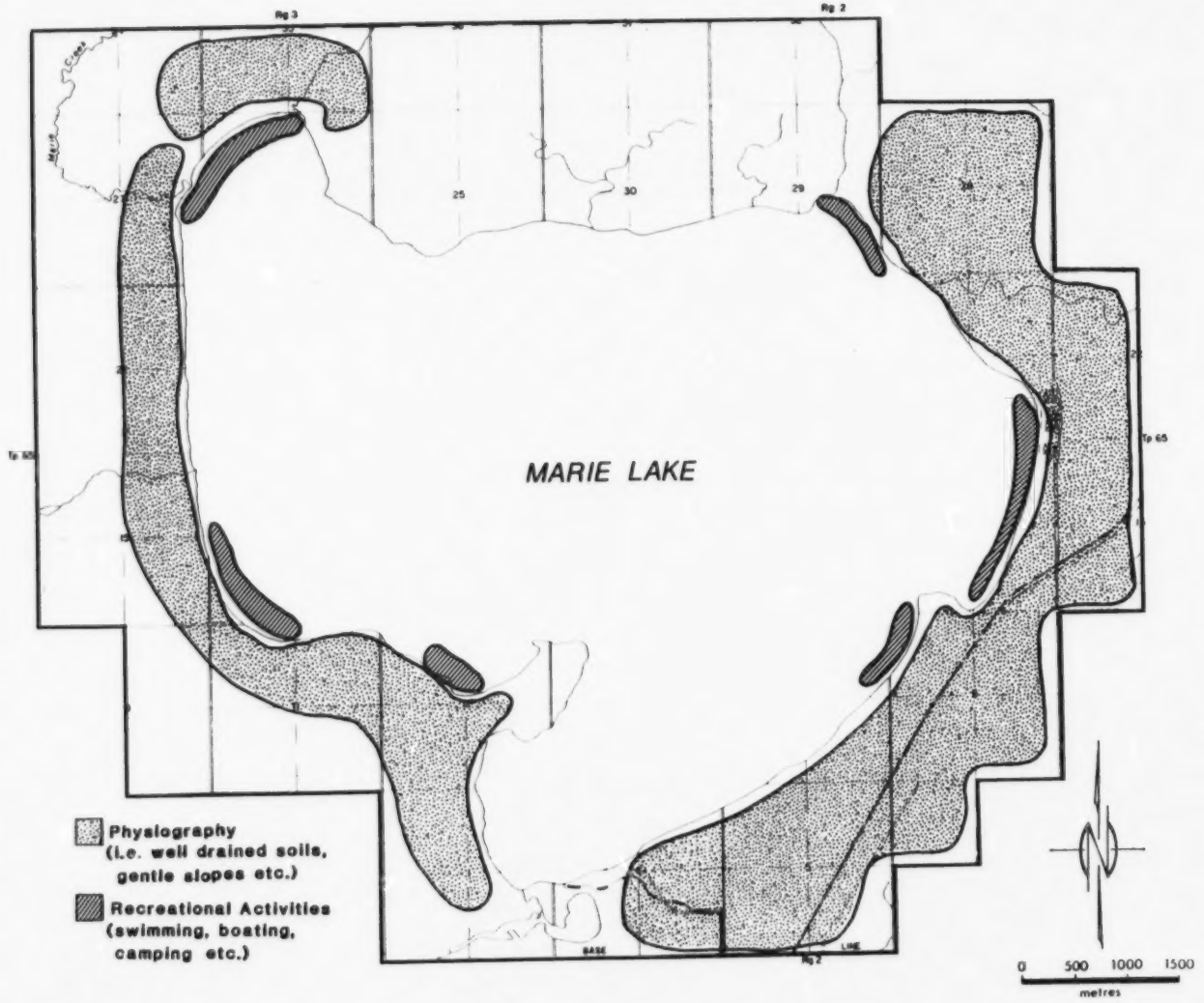
(e) The overall size, configuration and depth of the lake is conducive to recreational activities. Only the shallow areas south of the peninsula and a sand spit along the north western shoreline would restrict boating or water skiing, (refer to Map 3).

Map 5
SIGNIFICANT DEVELOPMENT CONSTRAINTS



Map 6

DEVELOPMENT POTENTIAL



6.2.3 Socio-Economics

(a) The questionnaire results indicated that the natural surroundings and the low undeveloped state of the lake are most valued by property owners.

(b) Field research and input from the Planning Committee indicate that lake use by other than existing property owners is minimal. This is primarily due to lack of public access to the lake.

(c) Calculations of the lake's capacity for recreational or residential use indicates that it is currently undeveloped and could potentially support increased development.

(d) Calculations of the lake's capacity for boating use indicates that the lake is currently undeveloped and that boat congestion or interference with the existing fish and wildlife habitats is minimal. The reason for this is the limited development on the lake and the lack of public boat launching facilities.

(e) Approximately 90% of the land within the planning area is Crown Land, managed by Alberta Forestry, Lands and Wildlife. Use of this land is provided through dispositions issued by the Provincial Government. Private development of Crown Land is required to receive development approval of the Improvement District.

(f) Esso Resources Canada Ltd. has oil sand leases for all land in the planning area (as well as petroleum and natural gas leases). At present there is no resource development but some potential for exploration, drilling and well production does exist.

(g) The demand for public access to the lake and the overall demand for recreational areas in Alberta has put considerable pressure on the Improvement District and the Province of Alberta to permit increased development on Marie Lake.

(h) Existing public access to the lake is minimal. The Primrose Highway along the eastern shoreline provides limited access but only through the residential subdivision. All other access points on the lake are private and not for public use.

(i) Current municipal plans, policies and regulations prohibit future residential subdivisions but do allow intensive and passive recreational activities.

6.3 Assessment

Overall, Marie Lake appears capable of supporting increased recreational and residential development. Beach areas and recreation sites are currently underused due to the low level of existing development and the lack of public access. Maps 3 and 6 identify those areas which provide recreational opportunities and development potential. To fulfill the goal of utilizing the recreational potential of Marie Lake, emphasis must be placed on providing both improved public access points and public boat launching facilities.

Based upon the conclusions of the resource capability, the following assessment of the lake's capacity to support future development is provided:

(a) Areas of poor soil drainage, high water table and fast/slow percolation rates have severe development limitations. The potential for ground water, watershed and lake contamination from erosion or improperly treated sewage is very high in these areas.

(b) Areas of steep slope and rolling topography require protection against future development. The potential for water contamination from uncontrolled erosion along these shorelines is very high. Increased nutrient loading through runoff could cause excessive aquatic vegetation growth and result in eutrophication (oxygen depletion).

(c) According to Alberta Environment groundwater supplies and potability should be adequate to support future development, however, site specific analysis are necessary for each proposal.

(d) According to Esso Resources no lake water will be used to serve any resource development projects. Lake water levels will, therefore, be primarily dependent upon beaver dams and annual rainfall.

(e) It is important to protect and if possible, enhance existing fish habitats. These are very susceptible to excessive nutrient loading and shoreline sedimentation caused by erosion or congested boating activities. The areas of significant aquatic vegetation growths require protection to ensure that future shoreline development does not result in deterioration of these critical habitats. Important in this regard are the areas south of the peninsula and north of the Cold Lake Camping Society.

(f) The slow flushing period of Marie Lake plays a very important role in determining the development capacity. Increased nutrient loading caused by land clearing or improperly treated sewage could result in serious deterioration of the lake water quality. The assessment suggests, however, that increased development on Marie Lake, if properly located and planned to avoid excessive clearing, should not result in decreasing the overall water quality. Development along the north shore should be prohibited and land clearing elsewhere kept to a minimum. Developments requiring a sewage disposal system should be monitored and/or prohibited along the shoreline to prevent possible contamination.

(g) The potential effects of future development on wildlife is considered to be minimal. The existing habitat areas are considered marginal and most development would not result in the destruction of any key wildlife populations. Increased public access and development will, however, result in some conflicts with normal wildlife movements.

(h) All development proposals will be constrained by the lack of public roads in the planning area. Access extension is costly and will significantly affect future development. Neither Alberta Transportation nor the Improvement District have indicated their willingness to build any new roads to serve the lake. The Lake Management Plan must be sensitive to the monetary constraints of the Improvement District.

(i) As 90% of the land in the planning area is Crown Land, co-operation between the Provincial Government and Improvement District is essential to the development plan.

(j) Future resource development by Esso could have an effect the lake environment. Esso, however, has indicated their willingness to discuss their development plans to ensure input from the Improvement District.

(k) The potential for conflicts over land use between the existing and future development is very high. The questionnaire indicated that the existing users do not wish to have any more development on the lake.

6.4 Recommendations

While it has been determined that Marie Lake could support increased recreational and residential activities, development of all areas with potential may exceed the lake's physical capacity. Although existing property owners have objected to increased development, the low level of use and the increased pressure for recreational opportunities in Alberta indicates that an attempt must be made to reach a satisfactory compromise acceptable to all parties.

Based upon the assessment of the lake's development capacity, a number of recommendations have been established that would fulfill the management goals and objectives.

1. No new construction or development should be permitted within 30 m of the lake's high water mark.
2. No residential or recreational development should be permitted on those areas identified on Map 5 as having severe physiographic constraints.
3. Residential or recreational development could locate within those areas identified on Map 6 as having development potential.
4. Development should be prohibited in and immediately adjacent to areas of important fish and wildlife habitats (Maps 4 and 5).
5. Residential and intensive recreational development should be prohibited within the northern watershed of the planning area.
6. No new development should occur unless the developer is willing to provide public access to the proposed site and to the lake itself. Provisions must also be made by the developer for the availability of utility and other municipal services.

7. All new residential and intensive recreational development should provide technical information indicating sufficient supplies of ground water.
8. Public access to the lake could be permitted within the areas identified on Map 3 as having recreational potential.
9. All new development should locate on parcels large enough to support any required on-site sewage disposal system. These developments should be required to install a sewage disposal system which has been approved by Alberta Labour.
10. Any construction or development along the shoreline would have to be undertaken with minimal vegetation (aquatic or terrestrial) removal.
11. The provincial park proposal for the northeastern portion of the lake should be encouraged. This would reduce the pressure for increased public access to the lake, and reduce potential conflicts between existing property owners and day users.
12. Prior to any future development, an Historical Resources Impact Assessment would be required as per the guidelines established by Alberta Culture.
13. Power boating and water skiing should be prevented in those areas identified on Map 5 as being key fish habitats.
14. No commercial development should be permitted except as part of intensive recreational developments and at the discretion of the I.D.
15. No intensive agricultural operations should be permitted within the Planning Area.
16. Except for removable domestic piers or removable boat lifts, future development or structures proposed on the lake bed shall be required to obtain authorization from Alberta Energy and Natural Resources. Existing unauthorized developments which encroach on the lake bed shall obtain a Licence of Occupation from Alberta Energy and Natural Resources. Otherwise, they shall be removed.
17. The municipality, upon request from area residents, may apply to the Alberta Boating Regulation Review Committee for the imposition of appropriate boating regulations in specific locations of the lake.
18. Upon receiving the approvals from the Alberta Boating Regulation Review Committee, the municipality shall post and maintain signs in appropriate locations informing the public of the boating regulations in place.
19. The municipality, where possible, shall require new boat launch facilities to be located elsewhere from, or at the perimeter of public beach or swimming areas.
20. Adequate lake access and, where appropriate, parking facilities, shall be provided by the developer for each new proposal.
21. The expansion, modification or extension of existing uses maybe permitted subject to the approval of the I.D.
22. The Improvement District shall encourage the lot owners to establish a Cottage Owners Association.
23. Provisions should be made for adequate buffering between conflicting land uses such as recreation and residential.

7. DEVELOPMENT PLAN

7. DEVELOPMENT PLAN (Map 7)

7.1 Introduction

Based upon the assessment of development constraints and capacities, the management goals and objectives and the final recommendations, it is possible to identify a single development strategy for Marie Lake. Through a series of discussions with the planning committee and affected government agencies, an overall land use development plan evolved. This plan will be used as the framework for the preparation of general and site specific land use and development policies that would eventually be adopted and enforced as the Marie Lake Area Structure Plan.

This development plan was prepared by combining the following information into a single land use plan (Map 7)[1]:

- existing land uses;
- areas of limited development potential (Map 5);
- areas of development opportunities (Maps 3 and 6);
- management goals and objectives;
- future demand for recreational activities; and the
- questionnaire results.

These land use designations, however, are not the only possible development strategy for Marie Lake. Each statement could be altered or deleted, or the Improvement District could include new strategies or land uses. A final decision will be made by the Improvement District, after the public has had an opportunity to review the recommendations and provided their input at a public hearing.

The development plan consists of a set of proposed land use areas. The particular philosophy utilized in identifying each land use allocation is discussed below:

7.2 Rural Conservation Area

The objective of this area is to identify those sites with marginal development capabilities. The emphasis is placed on existing uses which maintain the wilderness quality of the lake environment.

Most of the land included in this district is Crown Land and it is recommended that no leases be issued which would result in any recreational or residential development.

Future development could be permitted providing the proposal would not result in any deterioration of the lake or its shoreline and the Improvement District was willing to amend the plan.

USES:
- agriculture;
- resource development;
- farmstead/country residential;
- passive recreational activities (providing no permanent development would occur).

7.3 Residential Area

The objective of this district is to identify those areas currently developed for residential purposes and includes only the existing subdivision along the eastern shoreline. Resubdivision of existing lots would be permitted providing it meets the development standards of the Land Use Order.

USES:
- single family dwellings;
- public recreation facilities (within public reserve areas).

[1] It should be noted that development of a proposed provincial park is contemplated in the allocation of land uses as this development is seen as a step towards achieving the management goals and objectives.

7.4 Potential Residential Area

The objective of this district is to identify those areas without severe limitations to development and have a high capability for future development. The emphasis is placed on moderate density residential land uses that would not result in conflicts with either existing land uses or the lake environment. The Improvement District may consider redesignating land within this area to the Residential Area upon evaluation of the following:

(a) availability of municipal services and utilities;
(b) suitability of access; and
(c) compatibility with both the natural environment and surrounding and uses.

7.5 Recreation Area

The objective of this district is to recognize existing intensive recreational developments. The emphasis is placed upon utilization of the lake's best recreational opportunities.

USES:
- campgrounds (public and private);
- rental facilities (accommodations and boats);
- playgrounds;
- boat launching facilities (including a parking lot);
- concessions;
- marinas.

7.6 Potential Recreation Area

The objective of this district is to identify those areas having the potential for future recreational development. The emphasis is placed on intensive recreation land uses for both public and private developments. The Improvement District may consider redesignating land within this area to the Recreation Area upon evaluation of the following:

(a) provision of municipal services and utilities;
(b) suitability of access; and
(c) compatibility with both the natural environment and the surrounding land uses.

7.7 Recreation Conservation Area

The object of this district is to identify generally undisturbed lands which have moderate to marginal development capabilities. The emphasis is placed on passive recreation uses that would have minimal environmental impact. No permanent developments would be permitted.

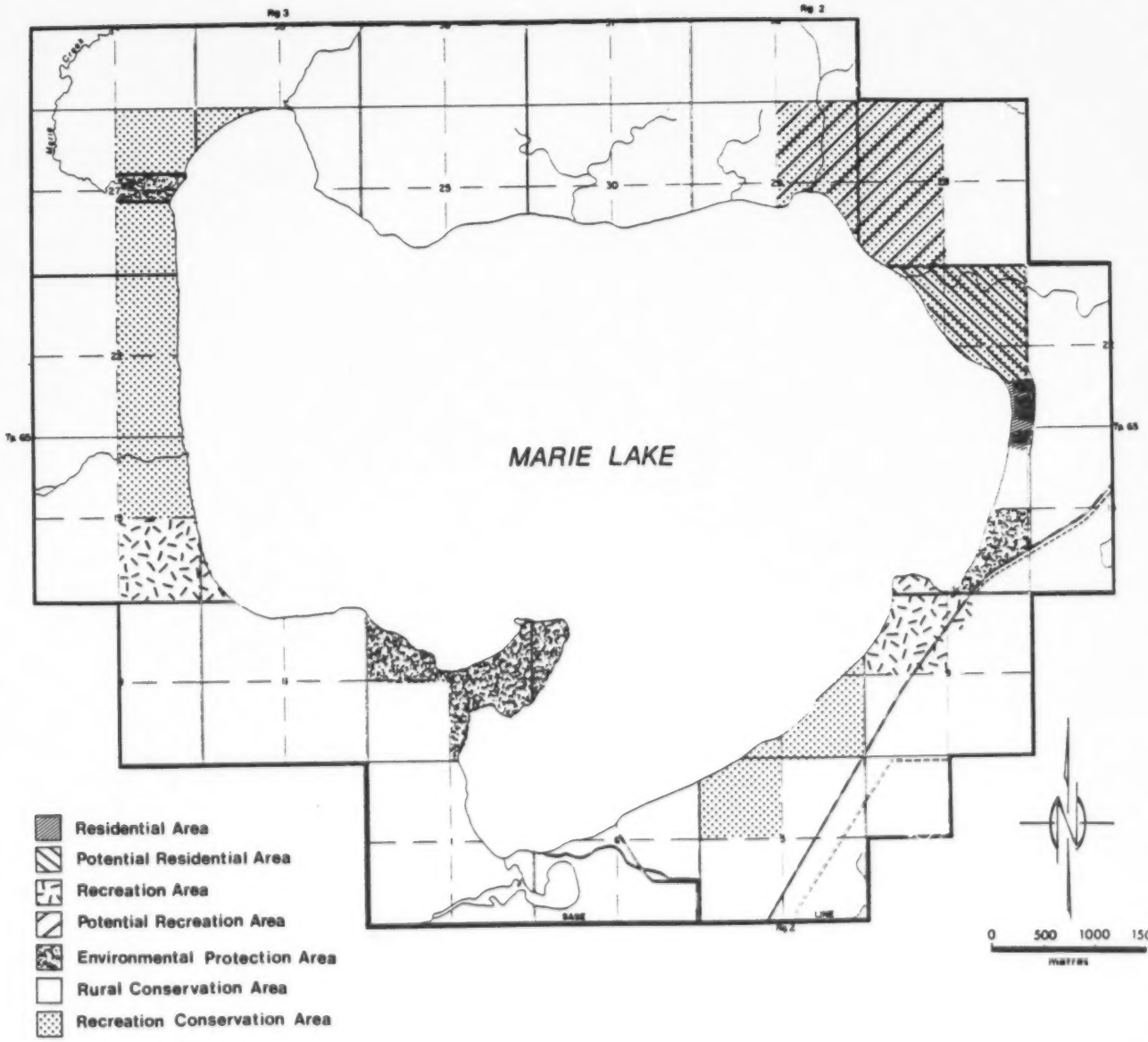
USES:
- activities such as walking/skiing trails;
- scenic observation areas
- hiking and low intensity day use activities.

7.8 Environmental Protection Area

The object of this district is to protect areas which have severe limitations to development. The emphasis is placed on restricting activities which may have a negative impact on the surrounding environment. Sensitive fish habitats, significant areas of shoreline aquatic growth, poor soils and topographic characteristics and areas important to the watershed are included in this district. Only existing uses may be permitted.

Map 7

DEVELOPMENT PLAN



8. APPENDICES

8. APPENDICES

8.1 APPENDIX A

Boating

To estimate the number of boats on Marie Lake for each use, the following assumptions were made from analysis of the property owner survey, field research and information supplied by the Planning Committee.

(a) Based upon 25 of the 46 survey respondents who indicated they owned a boat, it is assumed that of the 56 lot owners, 30 own a boat.

(b) It is assumed that within the recreational lease holdings, 25%[1] of the occupants operate a boat. In this case with 76 occupants, approximately 19 operate a boat.

(c) It is assumed that Alberta Fish and Game Association operate 1 boat.

(d) It is assumed that the agricultural sites operate 4 boats.

(e) It is assumed because of access problems and no public boat launching facilities, occasional day use for boating purposes is limited to 2 boats.

(f) It is assumed that most of the boats on Marie Lake will be motor boats. Field research and input from the Planning Committee and Alberta Recreation and Parks indicated that other types of boats (ie.) sailboats, canoes, etc are rarely used. The land owner survey indicated 87% of the respondents operated a motorboat.

TOTAL – 56 boats assumed to be available for use on Marie Lake during peak weekend periods.

[1] Alberta Recreation and Parks methodology